

INTRA-GROUP LIGHT IN HICKSON COMPACT GROUPS

Da Rocha, C.^{1,2}, Mendes de Oliveira, C.³ and Ziegler, B. L.¹

Abstract. We have analyzed the intra-group light component of 3 Hickson Compact Groups (HCG 79, HCG 88 and HCG 95) with detections in two of them: HCG 79, with $46 \pm 11\%$ of the total B band luminosity and HCG 95 with $11 \pm 26\%$. HCG 88 had no component detected. This component is presumably due to tidally stripped stellar material trapped in the group potential and represents an efficient tool to determine the stage of dynamical evolution and to map its gravitational potential. To detect this low surface brightness structure we have applied the wavelet technique OV_WAV, which separates the different components of the image according to their spatial characteristic sizes.

1 Introduction

The diffuse intra-group light (IGL) component is a useful tool to measure the intensity of the tidal interactions suffered by the galaxies and to map the extension and shape of the groups' gravitational potential and the dark matter halo.

In order to isolate the IGL we used the “à trous” wavelet transform with a Multi-Scale Vision Model (OV_WAV – Epitácio Pereira, Rabaça & Da Rocha 2005; Da Rocha & Mendes de Oliveira 2005), which does not depend on “a priori” information. The process detects different characteristic size structures, separating the types of light source in the image.

2 Observational Data and Analysis

We have studied 3 Hickson compact groups (Hickson 1982), in different evolutionary stages, (HCG 79, HCG 88 and HCG 95) as a pilot study for an IGL survey.

Simulated images were analyzed with OV_WAV and showed that we are able to detect low-surface brightness extended structures, down to a $S/N = 0.1$ per pixel, which corresponds to a $5\text{-}\sigma$ -detection level in wavelet space.

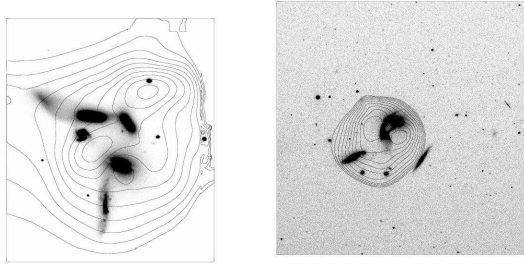
¹ Institut für Astrophysik Göttingen - Georg August Universität Göttingen - Germany

² Divisão de Astrofísica, Instituto Nacional de Pesquisas Espaciais - DAS/INPE - Brazil

³ Instituto de Astronomia, Geofísica e Ciências Atmosféricas - USP - Brazil

Table 1. Properties of the IGL component detected in our sample.

Group	% (B and R)		$\langle \mu \rangle_B$	B_{IGL}	$(B - R)_0$
HCG 79	$46 \pm 11\%$	$33 \pm 11\%$	24.8 ± 0.16	14.0 ± 0.16	0.86 ± 0.22
HCG 95	$11 \pm 26\%$	$12 \pm 10\%$	27.3 ± 0.30	16.9 ± 0.30	1.75 ± 0.34

**Fig. 1.** B band image with IGL in contour curves superposed, ranging from 24.2 to 25.1 magnitudes for HCG 79 (left) and from 26.9 to 27.8 magnitudes for HCG 95 (right).

3 Results and Conclusions

We have detected IGL in HCG 79 and HCG 95. HCG 79 has an irregular IGL distribution, which closely matches the X-Ray distribution (Pildis et al. 1995) and is bluer than the galaxies ($(B-R) = 1.5$), possibly a mix of stripped material from the outer parts of the galaxies and blue dwarf galaxies destruction. HCG 95 has an almost spherical IGL distribution, with colors typical of old stellar populations. Non-detection of IGL in HCG 88 indicating an early stage of dynamical evolution.

We suggest an evolutionary sequence: HCG 79, in an advanced stage of dynamical evolution; HCG 95, intermediate stage; and HCG 88, initial epoch still without IGL. The presence of an IGL component indicates gravitationally bound configurations in which tidal encounters already stripped a considerable fraction of mass from the member galaxies and an advanced stage of dynamical evolution, providing a test for formation and evolution models of groups.

We are conducting an IGL survey in HCGs. Results will be compared with N-body simulations in order to assess the dynamical age of those dense structures.

This project is supported by FAPESP (02/06881-4), CAPES/DAAD (BEX: 1380/04-4) and VW Junior Research Group - Kinematic Evolution of Galaxies - Volkswagen Foundation (I/76 520)

References

- Da Rocha, C. & Mendes de Oliveira, C. 2005, MNRAS, in press
 Epitácio Pereira, D. N., Rabaça, C. R. & Da Rocha, C. 2005, in preparation
 Hickson, P. 1982, ApJ, 255, 382
 Pildis, R. A., Bregman, J. N. & Evvard, A. E. 1995, ApJ, 443, 514